

Can we estimate the ν_e flux with the measured μ^+ rate?

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Abstract

Milind suggested that measurement of the $\bar{\nu}_\mu$ flux via reconstructed μ^+ in CC interactions could be used to estimate the ν_e flux if $\mu^+ \rightarrow e^+ \bar{\nu}_\mu \nu_e$ dominates $\bar{\nu}_\mu$ production. The prospects appear poor based on a study with GNUMI.

1 Introduction, results and conclusion

If $\mu^+ \rightarrow e^+ \bar{\nu}_\mu \nu_e$ is a substantial contribution to the $\bar{\nu}_\mu$ flux, then measurement of μ^+ in the near detector could give us a handle on the ν_e flux. Figure 1 shows that the contribution from muon decays is at less than 10 GeV and does not attain 20% of the total ν_μ flux based on GNUMI R15. The low energy $\bar{\nu}_\mu$ flux is dominated by $\bar{\nu}_\mu$ from π^- decays. If some way to isolate the ν_μ produced by π^- decays can be found, then the method might work. Otherwise it looks hopeless. For completeness, I show the composition of the ν_μ , $\bar{\nu}_\mu$, ν_e and $\bar{\nu}_e$ fluxes in Figure 2.

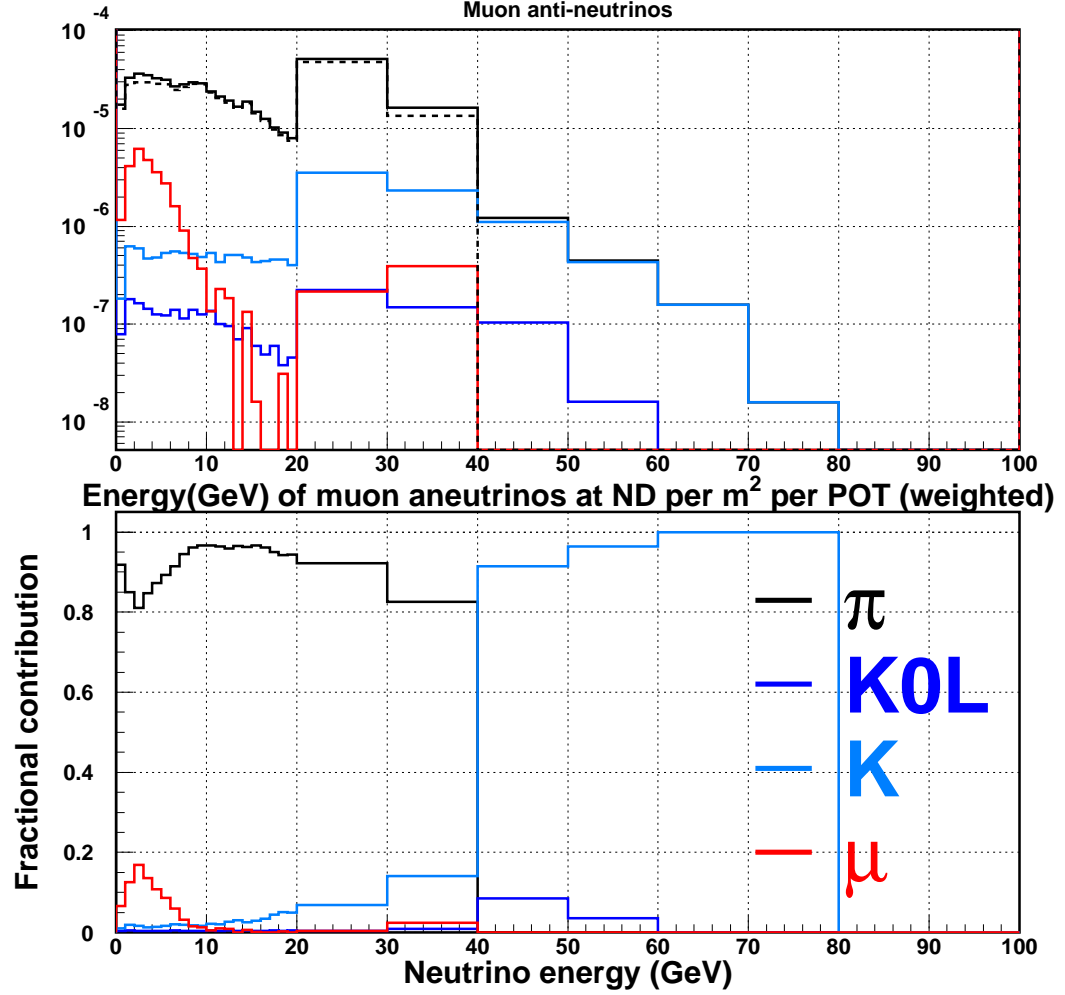


Figure 1: Upper: The total flux (solid black line) rates as a function of energy of $\bar{\nu}_\mu$ at the near detector. The contribution from pion, K0L, kaon and muon decays is indicated by the black dashed, dark blue, light blue and red lines, respectively. Lower: The fractional contribution to the neutrino flux as a function of energy from pions (black), K0L (dark blue), kaons (light blue) and muons (red). These plots were made with GNUMI R15 for the LE beam so they don't have the latest and greatest information about the beams. The gross features of the ratios probably don't change much.

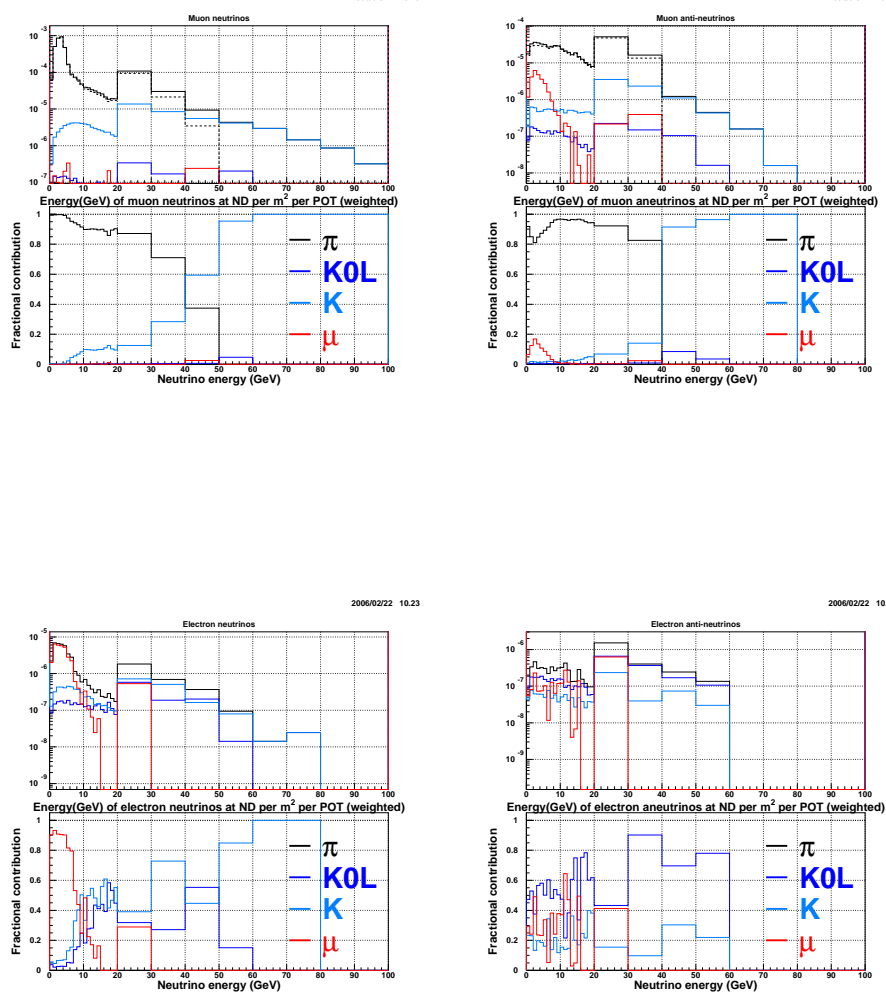


Figure 2: Upper: The total flux (solid black line) rates as a function of energy of ν_μ , $\bar{\nu}_\mu$, ν_e and $\bar{\nu}_e$ at the near detector. The contribution from pion, K0L, kaon and muon decays is indicated by the black dashed, dark blue, light blue and red lines, respectively. Lower: The fractional contribution to the neutrino flux as a function of energy from pions (black), K0L (dark blue), kaons (light blue) and muons (red). These plots were made with GNUMI R15 for the LE beam so they don't have the latest and greatest information about the beams. The gross features of the ratios probably don't change much.